

Low-Cost Sensor Based Home Security and Appliance Switching System With User Notification

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Abstract: Smart homes are fetching more attention and growing interest of people in the global market today. In this paper, we have proposed a design for low-cost smart home security and appliance switching system. As we know smart home implementation is an expensive feature which is not affordable by many households so we have proposed minimum cost smart home system with high-security features to enhance the quality of life of possessor. This system is equipped with all major security features which make it an essential system in homes. We have out fitted different sensors for different critical situations notification and control. There is an alert system which will alert the user about different security break by text message and buzzing the alarm. We are controlling switching of four appliances and saving energy by automatic on/off lights when the user enters in a room. We also proposed wireless remote control for home appliances which can be controlled with voice.

Keywords — GSM module, Bluetooth module, emergency contact, PIR motion sensor, temperature sensor, microcontroller, gas sensor, , smoke sensor, buzzer, accelerometer, LDR.

I. INTRODUCTION

The Smart Home System, also known as Intelligent Automated Home refers to the automation of our daily household electrical devices and appliances. Now a day's people prefer smart homes than an ordinary one so the construction and conversion of ordinary homes to smart home are on the rise and it will affect the total cost spends on constructing a home so we proposed a low cost highly secured smart home having appliance switching system feature. They are endorsed with advanced technologies like Bluetooth, voice control, different sensors, digital assistants and many more. In smart home people will get the assistance of energy saving, security and appliance switching while they are in their comfort zone and don't want to emerge. Being able to control the different appliance from your comfort zone is a wonderful thing for those who are old, tired, physically disabled or who don't scuttle so we have tried to provide that comfort to any age of peoples who want to enjoy the technology advancement implemented on a smart home system. There are many risks associated with their security features if the security compromised it will fall the system, keeping those risk in mind we tried to design a simple, convenient, less complicated and secure system with no compromise to its security details. As the smart home market is on the rise, we tried to introduce it in a low price, simple installation and in direction to make it general for middle-class households.

II. LITERATURE REVIEW

This literature review sheds lights on the work has been done so far in the field of the home security system. Today home automation and security system is the most burning

topic in the market. Daily we are seeing much advancement in-home security system; every person wants their home more secure, automated with less effort of maintenance so lots of work is going on the home security system to provide a user most secure home where user feel safe and secure. We have done some literature review to get the understanding of what work has been done so far in this field to get a direction and progress needed in making of more secure systems [6]. This review will provide the homeowner an insight of work has been done so far in home security and what he needs in his home which is illustrated as under-

- 1) *Bluetooth-based Home Automation System:* For Bluetooth technology android based GUI is developed to help the owner to communicate with his smart home.[8].
- 2) *GSM or Mobile-based Home Automation System (SMS-based Home Automation System :* GSM based systems access home appliances and control home security by sending and receiving commands in the form of SMSs. MQ2 and MQ7 sensors used to sense gas leakage. Delays in sending commands in case of weak mobile network [9].
- 3) *GPRS-based Home Automation System:* In this paper a home automation system based on WSN and GPRS is assembled. This enables users to control home appliances and collect in-house status and weather-related data. An integrated system-based core controller is used in this GPRS-based system. [11]
- 4) *IoT based home automation system:* This document uses Raspberry Pi, Sensors, IoT module to design the Home

Security Surveillance System and Automation. This design proprietor may monitor and be notified whenever he / she is in any part of the globe and may take appropriate action as we use WIFI module Sensors and IOT-enabled devices to meet smart home circumstances. In the event of sensor failure, due to a lot of dependence on sensors and internet access, the entire system will crash [7].

5) *Li-fi based Home Automation System:* The system uses wireless optical communications from Li-Fi. Electromagnetic interference-free communication is a major advantage of Li-Fi. The system control unit is introduced using Raspberry Pi and wireless communication modules are constructed using the Arduino board [5]

6) *Zigbee based Home Automation System:* Commands based on voice are adopted. Relays are used for controlling home appliances and the microcontroller is the Low-end controller for central processing unit. No integrated module of communication [10]

7) *Arduino UNO based Home Automation System:* ATmega328 microcontroller-based Arduino UNO board (1) automatic night light that only lights up at night when it detects any human being in close proximity; (2) 'Outside Mode' that turns off every single appliance connected to the system with a touch of android app when the user leaves home; (3) a smart security system that sounds an alarm, sends messages and calls to the user using GSM module. The Android app provides a user-friendly Graphical User Interface (GUI) to send a command via Bluetooth to the microcontroller

III. PROPOSED WORK

There are many systems present in market which are endorsed with advanced technologies like IoT, Bluetooth, smart phones, different smart sensors, digital assistance and many more in this paper we have proposed a home system having diverse feature which makes a home smart and energy-efficient as we have embedded sensors in different areas of home to get data for different criticality. The sensor we have used are a temperature sensor, humidity sensor, gas/smoke sensor, PIR motion sensor, LDR. A temperature sensor is used for getting temperature data inside a room, the gas/smoke sensor to check if there is any smoke inside home and humidity sensor for checking humidity level. PIR Motion sensor is used to determine motion inside the home as any person enters a room it will detect motion and system will ring the alarm and send message to the user and concerned authority for the intrusion. We have used the accelerometer to get notification regarding earthquake. Generally, if we are asleep we don't notice an earthquake immediately and for kids and aged people, it is unlikely to

act immediately as they took time to realize and analyze what is happening so to prevent any damage and provide an immediate alert to the user to leave home or get precaution we are using the accelerometer. Using GSM technology, home appliances can be controlled by sending messages from the user. We have also suggested a mobile application which will take voice command from user and control appliances. This suggested scheme is anticipated to use the android speech reader application to acknowledge the human voice. By keeping cost and security a major factor we have designed this system working on most required features. The methodology we have used in the implementation of a smart home system and its security is discussed here. Smart home systems consist of hardware, software,

IV. METHODOLOGY

The methodology we have used in the implementation of a smart home system and its security is discussed here. Smart home systems consist of hardware, software, communication systems, and electronic interfaces that work together to incorporate a range of electronic appliances to communicate. The microprocessor we are using is ARM cortex M0 series STM32F030C8T6. It is 48 pin microcontroller having 39 pins I/Os, 48 MHz clock, SPI, I2C, UART interfaces. The appliance control can be done by different methods it can be on/off by text message sent by the user or by voice control done over the mobile application. This proposed system will recognize the human voice using the voice reader android application to turn on and off the home appliance. We have developed an application which will take speech command from mobile phone and control appliance connected via Bluetooth. Thus the user can control appliances remotely. Here in block diagram nodes are the appliances and sensors which are controlled by the mobile application. The block diagram of speech controlled application to turn on and off home appliance is shown below

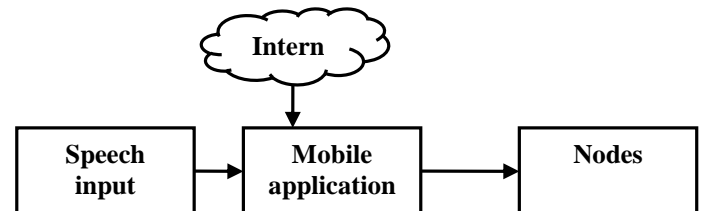


Fig. 1. Speech control application

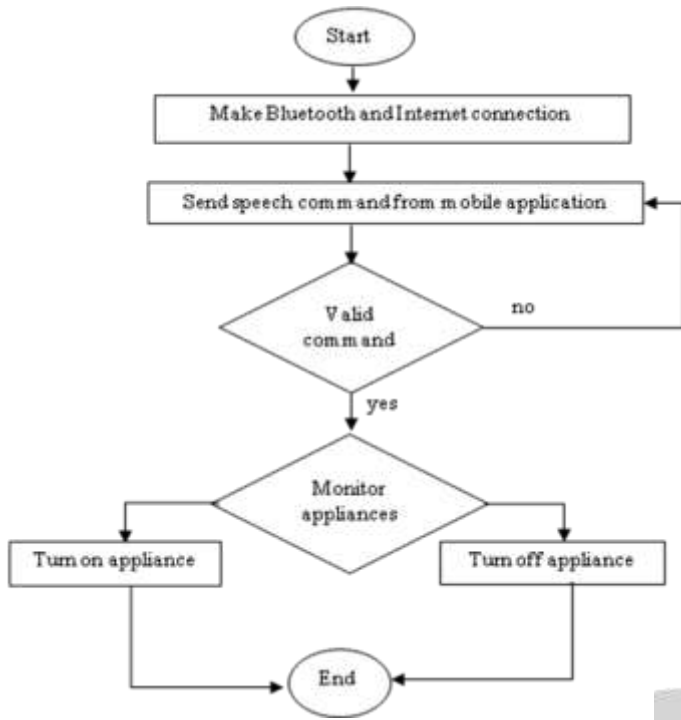


Fig. 2. Category 1 and category 2

Bluetooth module we are using in our project is HC-05. Bluetooth is used for interacting between appliances and mobile phone as a communication channel. For in house communication Bluetooth is the most apparent choice for wireless communication. It is cheap and easily communicable. For sending and receiving text messages SIM800 GSM module has been used. We have used LDR at entrance gates so if any person enters LDR will detect person entered through the gates and will notify a user and ring the alarm to stop the invasion. The temperature/humidity sensor we are using is DHT11. Proximity sensor is used as a PIR motion sensor. This sensor is worked on IR principal the infrared rays will detect a person in close proximity to this sensor and notify a user about any movement inside the home. If a person enters in a room Motion sensor will detect that person motion and will automatically on/off lights of that room. The gas/smoke sensor we are using is MQ135 this sensor will detect if there is smoke in the room. Smoke can be caused by fire and LPG leakage in the kitchen which is dangerous. We have interfaced these sensors, buzzer, GSM module, Bluetooth module and appliance control features via a microcontroller. A block diagram of the microcontroller interface has been shown under-

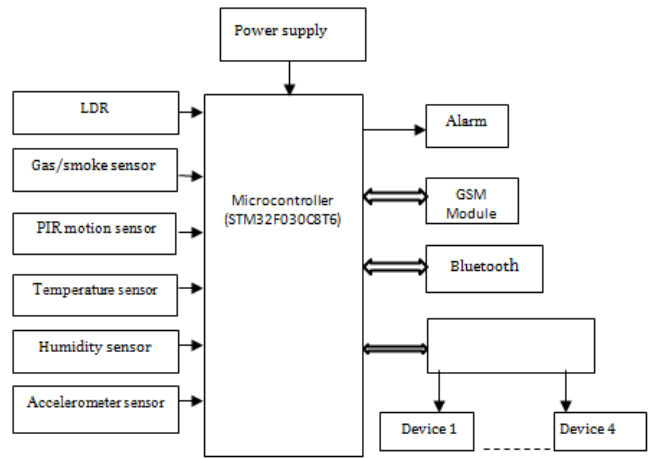


Fig.3. Block diagram of the proposed system

In flow diagram we have shown the working of a home security system. When we power up the system it will initialize sensors and communication modules starts reading all the sensors data and compares it with our desired result. If sensors receive uninterrupted desired data then it will perform continuous operation of receiving and analyzing and comparing data with desired data. When sensor receive data out of our desired range it will enter in to critical condition mode and beep the buzzer and send command to other communicating devices to send message to user or to any other concerned authority to alert them about the situation. The flow diagram of the proposed system is shown in the figure below:

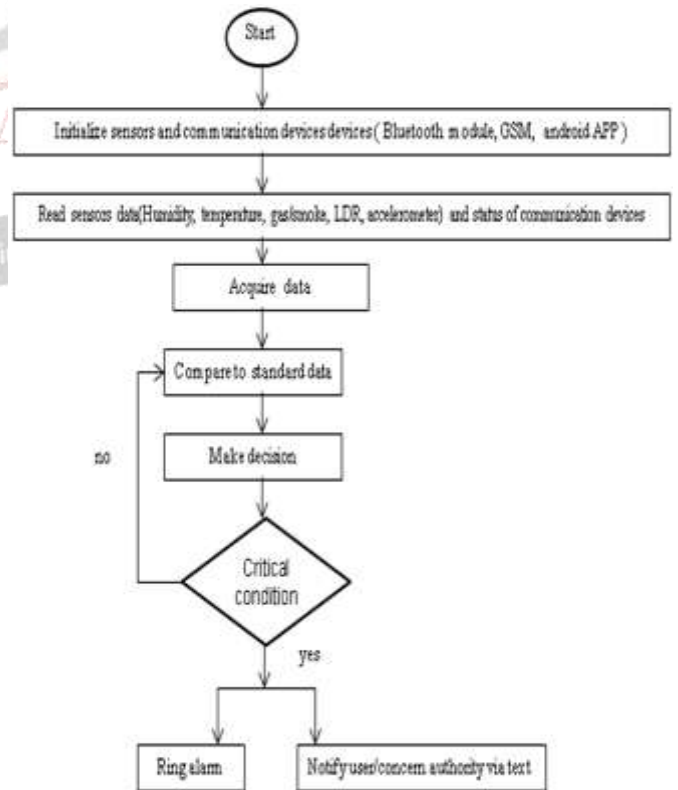


Fig.4. Flow diagram of working of smart home system

V. CONCLUSION

In this article, after analyzing and understanding future

danger and predictability of misuse of a smart home scheme, we provided a solution that probably decreases potential losses and future market dangers. A low-cost home automation safety system makes it affordable and user-friendly for many individuals who need remote appliance control to secure their home. We worked on those features which are most critical and tried to provide a cost-efficient solution, convenient remote access, energy efficiency, and security. We have used a single network for accessing the home automation system to diminish risk. We can make this system more advanced by adding more features as technology is upgrading day by day but the limitation is cost and security.

In future to enhance security we can use encrypted message which would be unlocked by the user only so security would not be breached and no other person gain access we can connect this system with IoT also so it will be accessed by internet. For this to implement we need to educate users on how to use, protect, and maintain their system We can put many user-friendly features for elderly and disabled people so older people living alone in the home would feel safe. We can put a weather monitoring system so the user will be alarmed about the weather before stepping out of the home. We can use a pressure sensor to ensure the flow of oxygen as during fire break due to smoke and fire oxygen get undersupplied which cause haphazard results we can also provide oxygen pipes in rooms which is most used by the user or as per user need to provide the oxygen supply in time of need. As we know nowadays power consumption is a big issue so to save power and make this system energy efficient we can use solar energy to run the appliance on. Instead of Wi-Fi or Bluetooth, we can propose Li-Fi for less interference and large area coverage in closed premises. There are smart plugs are also available in the market nowadays to get a check on energy consumption. In future Artificial intelligence technology can also be used for taking and implementing decision regarding security for smart homes.

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